

**IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF GEORGIA  
ATLANTA DIVISION**

FAIR FIGHT ACTION, INC, *et al.*,

*Plaintiffs,*

v.

BRAD RAFFENSPERGER, *et al.*,

*Defendants.*

Civ. Act. No. 18-cv-5391 (SCJ)

**Response of Plaintiffs' Expert Stephen C. Graves  
to Expert Report of Defendants' Expert Sean P. Trende**

January 31, 2020

Response to **Expert Report of Sean P. Trende** by Stephen C. Graves

The basic argument in the Trende Expert Report is that with the Fulton County sample data, we cannot make an assertion that the relationship between % African American share and wait time at a polling site is statistically significant, using traditional scientific standards. I have two reactions to the report, which I discuss below.

The first is that in my statement I did not assert that we found from the Fulton County sample a statistically significant relationship between % African American share and wait time at a polling site. Rather the intent of my work was to provide support for the findings reported in “The 2018 Voting Experience: Polling Place Lines”, November 2019, available at <https://bipartisanpolicy.org/report/the-2018-voting-experience/>, by Mathew Weil, Charles Stewart III, Tim Harper, Christopher Thomas. As I state in my report, my main finding is:

“Based on my analysis that I report here, it is my opinion that the general findings in the BPC/MIT report, for the case of Fulton County in Georgia are accurately stated.”

So my effort entailed getting the raw data that had been collected as part of the BPC/MIT study for Fulton County, replicating their analysis to compute an estimate of the wait time at each polling site in the sample and then examining the relationship between wait time and the % African American share. In my statement I report the detailed findings, and conclude that what we see from the data and from the analysis is consistent with what is reported in the BPC/MIT report, for the case of Fulton County in Georgia.

My second comment relates to the analysis reported in the Trende Expert Report. The Trende Expert Report provides a set of statistical tests using the Fulton County data. The general finding, as reported in the Trende Expert Report, is that there is a greater than 5% probability that the data we observe in the Figure could have occurred even if there were no relationship between % African American

share and wait time. Based on the different tests conducted, the report finds that this probability is between 20 and 60%. Based on this analysis, the report concludes “...that evidence from Fulton County, Georgia in 2018 is insufficient to support a conclusion that an increased African-American share of registered voters was associated with greater wait times...”

I would raise an objection to this analysis and conclusion.

The first test reported in the Expert Report (paragraph #37) relies on the linear regression model to test two competing hypotheses: a null hypothesis ( $H_0$ ) that there is no relationship between the African-American share of registered voters and wait times, versus an alternative hypothesis ( $H_1$ ) that there is a relationship between the African-American share of registered voters and wait times.

For the regression model, these hypotheses can be stated in terms of the value of the slope coefficient:

$H_0: \beta_1=0$

$H_1: \beta_1 \neq 0$

Critically, the alternative hypothesis includes the possibility that the slope coefficient could be positive or negative; that is, the alternative hypothesis is that wait time might increase or decrease with an increase in the share of Black registered voters.

My objection is with the relevance of the alternative hypothesis. There is a reasonable belief, as well as anecdotal evidence from past elections, that African American voters have longer waits than other voters. For instance, the MIT/BPC report (page 7), citing survey results from the 2018 Cooperative Congressional Election Study (CCES), reports that for 2018:

“African American (11.5 minutes) and Hispanic (11.7 minutes) voters waited longer, on average, than white voters (8.8 minutes).” Indeed, the relevant issue to be tested is whether or not wait times increase with the share of Black voters.

In light of this, I’d propose restating the relevant hypotheses as follows:

Null hypothesis ( $H_0$ ): there is not a positive relationship between the African-American share of registered voters and wait times,  $\beta_1 \leq 0$ .

Alternative hypothesis ( $H_1$ ): there is a positive relationship between the African-American share of registered voters and wait times,  $\beta_1 > 0$

Thus, we want to test directly whether wait time increases with the African-American share of registered voters. The implication of this modification in the hypotheses is that one now relies on one-sided tests rather than two-sided tests for determining the p-value and testing the hypotheses. This is a less stringent test but is more relevant for the given question at hand. When one repeats the tests in the Expert Report, one gets a p-value of 0.16, which is half of what is reported in the Expert Report.

Thus, we find that there is a probability of 0.16 of observing the sample results, under the assumption that the null hypothesis is true, namely that there is no relationship between wait time and share of Black voters. Admittedly, this is still not at the “gold standard” of 5% deemed necessary to reject the null hypothesis. But it does imply that we have an 84% confidence level that the true value of the slope coefficient is positive.

The second test (paragraphs #39, 40) and third test (paragraphs #41, 42) are based on splitting the 67 polling sites into two groups, depending on whether a majority of the registered voters at the polling site are African American or not.

For the second test, the Expert Report conducts a weighted t-test to assess whether there is a difference in the wait-time means between the two groups of polling sites. The third test is similar to the second test, but now uses a non-parametric statistical test (referred to as either a Wilcoxon test or a Mann Whitney U test). For both tests, the hypotheses being tested in the Expert Report are effectively:

Null hypothesis ( $H_0$ ): there is no difference in wait times between the Black majority polling sites and the other polling sites.

Alternative hypothesis ( $H_1$ ): there is a difference in wait times between the Black majority polling sites and the other polling sites.

I have the same objection with these tests as for the first test, in that the alternative hypothesis includes both when the wait time is either shorter or longer at the Black-majority polling sites compared to the other polling sites. This is a more stringent test than warranted, given that the relevant issue of interest is whether or not Black-majority polling sites have longer wait times than the other polling sites.

Similar to the first test, I'd propose restating the relevant hypotheses as follows:

Null hypothesis ( $H_0$ ): there is no difference in wait times between the Black majority polling sites and the other polling sites.

Alternative hypothesis ( $H_1$ ): the wait times at the Black majority polling sites are greater than that at the other polling sites.

Again, the implication of this modification in the hypotheses is that one now relies on one-sided tests rather than two-sided tests for determining the p-value and testing the hypotheses.

When we redo the weighted t-test, we get a smaller p-value: there is a probability of 0.31 of observing the sample results, under the assumption that the null hypothesis is true, namely that there is no difference in wait time between the two groups of polling sites. Again, this is still not at the "gold standard" of 5% deemed necessary to reject the null hypothesis. But it does imply that the alternative hypothesis is more likely than the null hypothesis; using a standard of the preponderance of evidence, we might conclude that this test supports a finding that the wait times at the Black majority polling sites are greater than that at the other polling sites.

When we redo the non-parametric test, we get a p-value of 0.11. Thus, there is a probability of 0.11 of observing the sample results, under the assumption that the null hypothesis is true, namely that there is no difference in wait time between the two groups of polling sites. Again, this is still not at the "gold standard" of 5% deemed necessary to reject the null hypothesis. But it is close to this standard. Whereas we cannot reject the null hypothesis with a beyond-a-reasonable-doubt standard, one might contend that there is clear and convincing evidence to reject

the null hypothesis and accept the alternative, namely that the wait times at the Black majority polling sites are greater than that at the other polling sites.